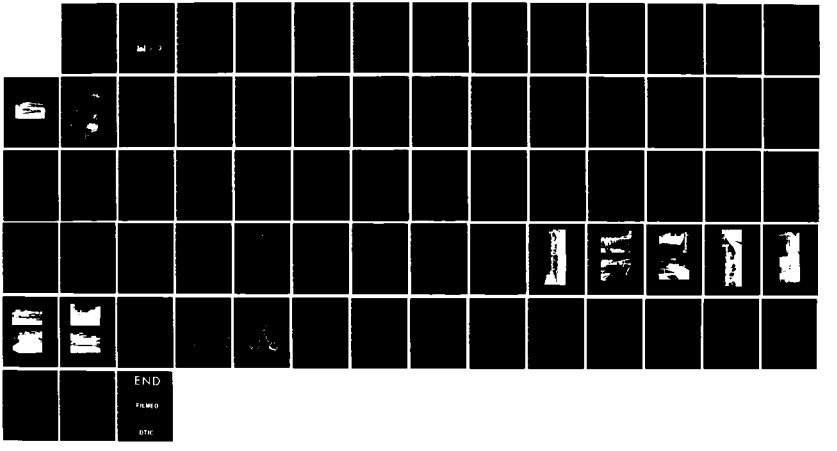
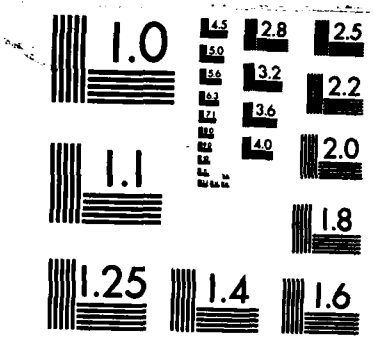
AD-A154 668 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 1/1
MOODY STREET DAM (MA.. (U) CORPS OF ENGINEERS WALTHAM MA
NEW ENGLAND DIV FEB 79

UNCLASSIFIED F/G 13/13 NL





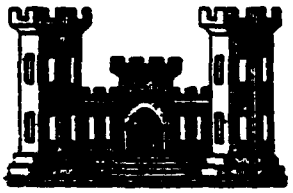
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

MASSACHUSETTS—RHODE ISLAND COASTAL BASIN
WALTHAM, MASSACHUSETTS

AD-A154 668

MOODY STREET DAM
MA 00345

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

FEBRUARY 1979

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER MA 00345	2. GOVT ACCESSION NO. AD-A154 668	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Moody Street Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE February 1979 13. NUMBER OF PAGES 63
14. MONITORING AGENCY NAME & ADDRESS(*if different from Controlling Office*)		15. SECURITY CLASS. *(of this report)* UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

DAMS, INSPECTION, DAM SAFETY,

Massachusetts-Rhode Island Coastal Basin
Waltham, Massachusetts
Charles River

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The dam consists of a 169 ft. long granite masonry structure with a full-length overflow spillway, a downstream apron and a fishway structure. It appears to be in good condition. Because of the size (intermediate) and hazard potential (high) the test flood for this dam is the Probable Maximum Flood.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF

NEDED

APR 17 1979

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

I am forwarding to you a copy of the Moody Street Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Commonwealth of Massachusetts, Metropolitan District Commission, 20 Somerset Street, Boston, Massachusetts 02108, ATTN: Mr. Martin Weis, Chief Engineer.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely yours,

JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

MASSACHUSETTS-RHODE ISLAND COASTAL BASIN
WALTHAM, MASSACHUSETTS

MOODY STREET DAM

MA 00345

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS 02154

FEBRUARY 1979

PHASE I INVESTIGATION REPORT
NATIONAL DAM INSPECTION PROGRAM

Identification No.:	MA 00345
Name of Dam:	Moody Street
Town:	Waltham
County:	Middlesex
State:	Massachusetts
Stream:	Charles River
Date of Site Visit:	6 December 1978

BRIEF ASSESSMENT

The Moody Street Dam consists of a 169 ft. long granite masonry structure with a full-length overflow spillway, a downstream apron and a fishway structure. The maximum height of the dam, measured from the top of the left training wall to the stream channel bottom just downstream of the apron, is approximately 22 ft. Flow is controlled by flashboards mounted beneath a walkway which extends along the length of the spillway. The masonry dam was originally constructed in 1847 to provide water for mills and now serves only as a river level control. The fishway was added in 1978.

Due to the extent of downstream development that would be affected in the event that the dam were to fail, Moody Street Dam is confirmed as having a "high" hazard potential in the Corps of Engineers National Inventory of Dams.

The visible portions of the dam appear to be in good condition, based on the examination. However, the overall condition of the dam can only be considered fair, primarily becuase there is no apparent means of lowering the water level below the spillway crest. In addition, the condition of the weir and apron was obscured by water flow. No evidence of settlement, lateral movement or other signs of structural failure, or other conditions which would warrant urgent remedial action were noted.

Based on the size (intermediate) and hazard potential (high) classifications in accordance with Corps of Engineers guidelines, the test flood for this dam is the Probable Maximum Flood (PMF). Hydraulic analyses indicate that the PMF outflow of 14,560 cfs (inflow 14,800 cfs or 65 csm) would overtop the dam (left training wall) by about 3.8 ft. With the water level at the top of the left training wall, the spillway capacity without flashboards is 7,800 cfs, which is 54 percent of the test flood.

The Metropolitan District Commission, owner of the dam, should assign or engage a registered professional engineer to 1) investigate means of lowering the water level below the spillway crest, 2) examine the condition of the spillway weir, downstream apron and flashboards at a time when there is low flow over the spillway and 3) assess the stability of the dam during earthquake loading, as outlined in Section 7.2. The results of those investigations and remedial measures, including preparation of an operation and maintenance manual and an emergency preparedness plan as outlined in Section 7.3, should be implemented by the owner within one year after receipt of this report. As also recommended, a program of biennial periodic technical inspections should be instituted.

HALEY & ALDRICH, INC.
by:

Peter L. LeCount
Vice President

This Phase I Inspection Report on Moody Street Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Joseph A. McElroy

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Joseph W. Finegan, Jr.

JOSEPH W. FINEGAN, JR., CHAIRMAN
Chief, Reservoir Control Center
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the office of Chief of Engineers, Washington, DC 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the test flood is based on the estimated "probable maximum flood" for the region (greatest reasonably possible storm run-off), or a fraction thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential. Consideration of downstream flooding other than in the event of a dam failure is beyond the scope of this investigation.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures

There are general, but not formal procedures for routine maintenance and operation of the dam.

4.2 Maintenance of Dam

There are no established procedures or manuals to assure periodic inspection and maintenance of the dam.

4.3 Maintenance of Operating Facilities

There is no formal plan to maintain the flashboards at the spillway. The height of flashboards is increased for the spring and summer and decreased for the winter months.

4.4 Description of any Warning System in Effect

There is no warning system or emergency preparedness plan in effect for this structure.

4.5 Evaluation

The owner should prepare an operations and maintenance manual for the dam. The manual should delineate the routine operational procedures and maintenance work to be done on the dam to ensure satisfactory operation and minimize deterioration of the facility.

Since failure of the dam would probably cause loss of life and extensive property damage downstream, the owner should also prepare a formal emergency preparedness plan and warning system.

The overall condition of the Moody Street Dam project can only be considered fair, primarily because the lack of a means to lower the water below the spillway crest is considered to be a significant deficiency.

The upstream end of an old canal is visible near the orth end of Moody Street Bridge, Photo No. 10. The canal as been filled in with rocks, earth and a concrete wall to height of about 3 in. above the adjacent original stone asonry walls.

d. Reservoir Area. The area along the Charles River pstream from the Moody Street Dam is highly developed nd has low relief, Photos No. 1 and 9. There appears to e no probability that landslides into the river would cause aves which would overtop the dam. No conditions which ight result in a sudden increase in sediment load into the iver were noted.

e. Downstream Channel. The Charles River flows in a eneral easterly direction from the Moody Street Dam to the iver's mouth at Boston Inner Harbor. The Bleachery Dam, hich is located about 0.8 miles downstream from the Moody treet Dam, has a crest elevation of 20.6 ft. The Water- own Dam is located about 2.8 miles downstream from the loody Street Dam and has a crest elevation of 8.6 ft.

There are industrial, residential, commercial and re- reational developments on both banks of the river. Two ailroads and road crossing exist over the river between he Moody Street Dam and the Bleachery Dam. The MDC is urrently involved in an improvements program in this rea which includes removal of some buildings located in he river's flood plain and adding new operational acilities such as a fish ladder and quick release flash- oard mechanisms to the dam.

The channel is about 80 ft. wide and about 12 ft. deep t a distance of about 150 ft. from the Moody Street Dam he channel width increases to about 120 ft. at a section bout 300 ft. downstream of the existing Waltham gaging tation, or about 1,100 ft. from the dam.

There is a new reinforced concrete training wall on he left side of the channel extending downstream from he fishway and both banks are lined with riprap. Photos o. 11 and 12 show the condition of the downstream channel.

.2 Evaluation

Based on the examination of 6 December 1978, visible ortions of the dam appear to be in good condition. However, nother examination should be made at a time when there is ow flow to observe the condition of the granite masonry pillway weir, the downstream apron and individual flashboards.

SECTION 3 - VISUAL EXAMINATION

3.1 Findings

a. General. The Phase I visual examination of the Moody Street Dam was conducted on 6 December 1978.

The visible portions of the dam appear to be in good condition. However, water flowing over the spillway weir prevented a complete visual examination. For that reason, and because there is no apparent means of lowering the water level below the spillway crest, the overall condition of the dam can only be considered fair at this time.

A visual inspection check list is included in Appendix A and selected photographs of the project are given in Appendix C. A "Site Plan Sketch", page C-1, shows the direction of view for each photograph.

b. Dam. The spillway weir is constructed on granite masonry and is apparently founded on glacial till. A complete examination of the weir was not possible due to flow of water, Photos No. 1, 2, 3 and 4. The downstream apron was not visible. There is apparently no means to lower the water level below the spillway crest.

There was no indication of settlement or instability of the fill at the left abutment; no evidence of seepage was observed either in the low area beyond the abutment or in the lower floor of the adjacent old mill building.

c. Appurtenant Structures. A foot bridge is mounted along the crest of the spillway, with provision for 28 bays of flashboards. Thirteen bays had 2 flashboards and 15 bays had 3 flashboards in place. The foot bridge was in good condition, Photo No. 3. The condition of the individual flashboards was obscured by flow of water. The quick release mechanism for the flashboards (described in Section 1.3j) was not demonstrated.

The condition of masonry training walls was good, Photos No. 5, 6 and 8. Some minor staining and spalling was noted.

A new reinforced concrete fishway structure at the left end of the spillway was near completion, Photos No. 1 and 7. The condition of the fishway was excellent.

SECTION 2 - ENGINEERING DATA

2.1 Design Data

No design data for the original dam were located and none are believed to exist. Some details of the dam are shown on MDC Contract No. 253 drawings for the "Charles River Flood Control Project", dated 2 November 1959. Design details including boring logs for the fishway structure are included in MDC Contract No. E77-27 P&R drawings for the "Representative Richard E. Landry Riverbank Park Development", dated 15 December 1977. Selected sheets from these two sets of drawings are included in Appendix B.

2.2 Construction Data

No records of the construction of the original dam were located and none are believed to exist. Construction photos of the fishway are available at the MDC.

2.3 Operational Data

There were no operational records disclosed for the Moody Street Dam. The dam is part of the Charles River Basin system which is monitored at gaging stations located on the Charles River at Charles River Village, Mother Brook at Dedham and downstream of Moody Street Dam in Waltham.

2.4 Evaluation of Data

a. Availability. A list of engineering data available for use in preparing this report is shown on page B-1. Selected documents from the list are also included in Appendix B.

b. Adequacy. There was a lack of engineering data available to aid in the evaluation of Moody Street Dam. This Phase I assessment was therefore based primarily on visual examination, approximate hydraulic and hydrologic computations, consideration of past performance and application of engineering judgement.

c. Validity. There is no reason to doubt the validity of available data.

6. D/S channel..... Concrete and granite block apron extends 50 ft. downstream. Channel about 80 ft. wide and 12 ft. deep about 150 ft. downstream

j. Regulating Outlets. There are no regulating gates for the facility. The upstream water level is regulated by the addition of flashboards at the spillway. The crest of the spillway without flashboards is approximately El. 32.2. The use of the maximum amount of flashboards would raise the crest to approximately El. 35.0. The length of crest capable of receiving flashboards is approximately 169 feet.

In times of emergency, the flashboards could be quickly released by pushing down individual vertical steel arms located on the upstream side of the walkway, Photo No. 9. This, in turn, would push down the horizontal levers under the walkway, Photos No. 3 and 4, releasing the vertical flashboard stanchions to which they were hooked. Every second stanchion is equipped with this quick release mechanism, Photo No. 5, thereby releasing two bays of flashboards each and lowering the crest height to El. 32.2.

The fishway has a channel inlet 5 ft. wide by 7 ft. high with invert El. 30.5.

e. Storage (acre-feet)

1.	Recreation pool.....	2,100 (top of flashboards)
2.	Flood control pool.....	Not applicable
3.	Spillway crest.....	1,450
4.	Top of dam (left training wall).....	2,950
5.	Test flood pool.....	4,600

f. Reservoir Surface (acres)

1.	Recreation pool.....	250
2.	Flood control pool.....	Not applicable
3.	Spillway crest.....	205
4.	Test flood pool.....	560
5.	Top of dam.....	335

g. Dam

1.	Type.....	Granite masonry with overflow spillway
2.	Length.....	169 ft.
3.	Height (top left training wall to channel downstream of apron)...	22 ft. (approx.)
4.	Top width of weir.....	6.25 ft.
5.	Side slopes.....	Not applicable
6.	Zoning.....	Not applicable
7.	Impervious core.....	Not applicable
8.	Cutoff.....	Unknown
9.	Grout curtain.....	Unknown
10.	Other.....	Top of spillway weir approx. 7.5 ft. above top of apron

h. Diversion and Regulating Tunnel. Not applicable

i. Spillway

1.	Type.....	Overflow, granite masonry, gravity type
2.	Length of weir.....	169 ft.
3.	Crest elevation.....	32.2
4.	Gates.....	None (flashboards are a maximum of 2.8 ft. in height)
5.	U/S channel.....	Moody Street Bridge with 9 arched openings about 100 ft. upstream

3. Ungated spillway capacity (without flashboards) at top of dam (left training wall)... 7,800 cfs at El. 37.9 (3,100 cfs with flashboards up to El. 34.8)
4. Ungated spillway capacity (without flashboards) at test flood pool elevation..... 13,450 cfs at El. 41.7
5. Gated spillway capacity at normal pool elevation..... Not applicable
6. Gated spillway capacity at test flood pool elevation..... Not applicable
7. Total spillway capacity at test flood pool elevation..... 13,450 cfs at El. 41.7
8. Total project discharge at test flood pool elevation..... 14,560 cfs at El. 41.7

c. Elevation (ft. above MSL)

1. Streambed at centerline of dam (D/S of apron).. 16.4
2. Maximum tailwater..... Unknown
3. Upstream portal invert diversion tunnel..... Not applicable
4. Recreation pool..... 35.0
5. Full flood control pool.. Not applicable
6. Spillway crest
   (without flashboards).. 32.2
   (with flashboards)..... 35.0
7. Design surcharge - original design..... Unknown
8. Top of dam (left training wall)..... 37.9
9. Test flood design surcharge..... 41.7

d. Reservoir

1. Length of maximum pool... 3.0 mi. (Est.)
2. Length of recreation pool..... 2.6 mi. (Est.)
3. Length of flood control pool..... Not applicable

In 1978, a fishway structure was added at the left end of the dam, as part of the Representative Richard E. Landry Riverbank Park Development. It is reported that the apparent remains of an old sluiceway were discovered during construction of the fishway. This project also included construction of a concrete retaining wall on the left side and placement of new riprap on both sides of the downstream channel, as shown on page B-9.

i. Normal Operational Procedures. The dam is operated by the insertion and removal of flashboards at the crest of the spillway. The operator reportedly maintains a water level of about El. 35.0 behind the spillway with a full height of four flashboards in place from spring through summer. In the fall, the height of the weir is reduced by removing two levels of flashboards, dropping the water surface to about El. 33.7 during the winter months. During periods of high water, MDC teams patrol the dams which regulate the flow in the upstream portions of the basin. These teams also inspect the Moody Street Dam for ice build-up.

1.3 Pertinent Data

All elevations reported in the text of this report are referenced to Mean Sea Level (MSL) datum. MDC records and drawings show elevations referenced to Boston City Base (BCB) datum. To convert a MSL elevation to BCB, it is necessary to add 5.65 ft.

a. Drainage Area. The drainage area of the Moody Street Dam on the Charles River is approximately 225 sq. mi. (251 sq. mi. , including the Stony Brook flow which is diverted for the municipal water supply of Cambridge). The drainage area includes highly developed and rapidly growing suburban and rural areas. Within the drainage area, there are more than 30 lakes and ponds having a total surface area of about 2,500 acres. The drainage area is bordered by the Merrimack River basin on the west, the Mystic River basin on the north, the Neponset River basin on the east and the Blackstone and Taunton River basins on the south.

b. Discharge at Dam Site

1. Outlet Works..... None
2. Maximum known flood at dam site..... 3,670 cfs on 25 January 1979

to fail by dam failure analysis computations in Appendix D which are based on "Guidance for Estimating Downstream Dam Failure Hydrograph" by the Corps of Engineers. If the dam were breached, the developed areas on both banks of the Charles River would be subject to flooding. The impact area would include a manufacturing establishment, parking lots, ground and basement floors of several apartment blocks, and a playground. The potential for loss of life would be high and damage to property would be extensive.

e. Ownership. The name and address of the current owner is:

Commonwealth of Massachusetts
Metropolitan District Commission
20 Somerset Street
Boston, MA 02108

The MDC has owned the dam and flowage rights since 1936 and acquired water rights in 1972. Between 1933 and 1936 the dam was owned by the Waltham Factories. Prior to 1933 the owner was the Boston Manufacturing Company.

f. Operator. Mr. Thomas J. Mooney, Superintendent of Locks and Drawbridges, is responsible for operation, maintenance and safety of the dam. His office address and phone number are as follows:

Metropolitan District Commission
250 Leverett Street
Boston, MA 02114
(617) 523-1793

g. Purpose of Dam. The dam was originally used to provide power and process water for mills and factories. Presently, the dam is used only for river level control.

h. Design and Construction History. A wooden dam was first constructed at this site in 1790 to provide power for a paper mill. The presently existing granite masonry structure was completed in 1847.

During the late 1800's a number of new mills were added. Structural changes that may have been made to the dam during this construction are not now apparent. The canal which extended around the left side of the dam (see 1959 site plan, page B-8) is now filled in.

1.2 Project Description

a. Location. Moody Street Dam is located on the Charles River, just downstream from the Moody Street Bridge, in Waltham, MA, as shown on the Location Map, page vii.

b. Dam and Appurtenances. The Moody Street Dam consists of a granite masonry structure with a full-length overflow spillway, a downstream apron and a fishway structure. The "Site Plan Sketch", page C-1, shows the general layout of the dam and appurtenananances. More detailed drawings are included in Appendix B.

The spillway weir is an overflow gravity type structure having a total length of approximately 169 ft. and a height of about 7.5 ft. measured from the top of the apron. A typical section of the upper part of the weir is shown on page B-8. Up to 4 levels (about 2.8 ft.) of flashboards which can be quickly released are mounted beneath an access walkway which extends along the length of the weir. The concrete and granite block apron extends about 50 ft. downstream.

A reinforced concrete fishway structure is located at the left end of the spillway and forms the downstream portion of the left training wall. Page B-10 shows a plan and profile of the fishway. The upstream portion of the left training wall and the right training wall are formed by vertical granite block retaining walls. The right abutment is close to the lower floor of a commercial building while the ground surface beyond the left training wall drops down several feet to an access drive and an old mill building.

The upstream end of a canal, which once carried water to factories located to the left of the dam, can be seen near the north end of Moody Street Bridge. This old canal and the sluiceways under the buildings are now filled in.

c. Size Classification. The storage to the top of Moody Street Dam is estimated to be 2,950 acre-ft., and the corresponding maximum height of the dam measured from the top of the left training wall to the stream channel just downstream of the apron is approximately 22 ft. Storage of from 1,000 to 50,000 acre-ft. and/or a height of from 40 to 100 ft. places a dam in the "intermediate" size category, according to the guidelines established by the Corps of Engineers.

d. Hazard Classification. This dam is confirmed as having a "high" hazard potential in the event it were

PHASE I INVESTIGATION REPORT
NATIONAL DAM INSPECTION PROGRAM
MOODY STREET DAM
MA 00345

SECTION 1 - PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region.

Haley & Aldrich, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed were issued to Haley & Aldrich, Inc. under a letter dated 28 November 1978 from Colonel Max B. Scheider, Corps of Engineers. Contract No. DACW33-79-C-0018 has been assigned by the Corps of Engineers for this work. Camp, Dresser & McKee, Inc. was retained as consultant to Haley & Aldrich, Inc. on the structural, mechanical/electrical and hydraulic/hydrologic aspects of the Investigation.

b. Purpose of Inspection. The primary purposes of the National Dam Inspection Program are to:

1. Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

2. Encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.

3. To update, verify and complete the National Inventory of Dams.

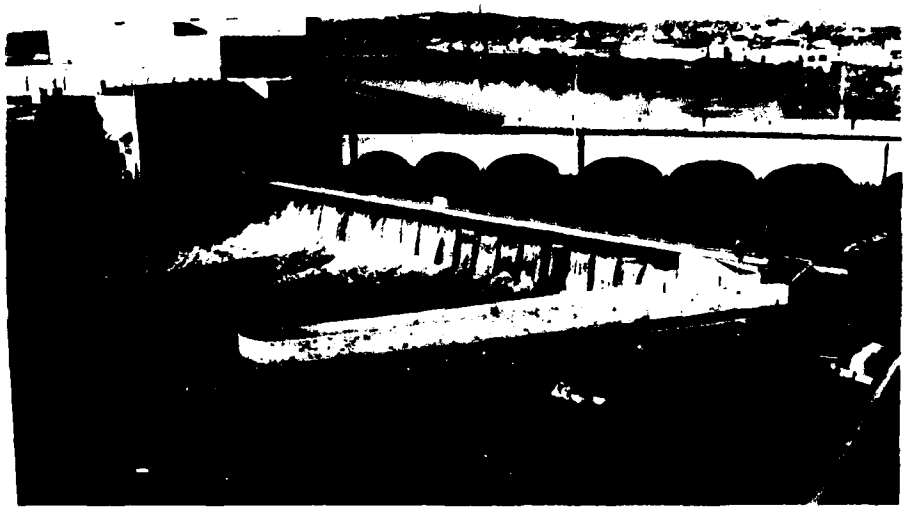
FILE NO. 4270 A2

DAM: Moody Street

IDENTIFICATION NO. MA 00345

N

LOCATION MAP
USGS QUADRANGLE
NEWTON, MA
APPROX. SCALE: 1"= 2000'



1. Overview of Moody Street Dam

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. General. The historical records indicate that the existing Moody Street Dam was built with granite blocks in 1847 to supply water for operation of cotton mills. All rights to the dam were acquired by the MDC in 1972. Water from the reservoir overflows the dam structure, usually at its full length. The water level in the reservoir is controlled with manually operated flashboards. A maximum static level fluctuation of about 2.8 ft. can be obtained by changing the number of flashboards.

A number of factors (moderate slopes, pervious granular soil, large swamplands, reservoir and lake storage) in the drainage area of the dam contribute to make this portion of the river unusually slow in responding to heavy rains.

b. Design Data. No hydrologic or hydraulic design data were available for this dam site.

c. Experience Data. The U.S. Geological Survey has maintained and published records of 4 stream gaging stations in the Charles River watershed. One of these stations, with stage recorder, is located about 800 ft. downstream of the Moody Street Dam. Datum of the gage is 20.02 ft. above MSL. The records at this station are classified as being "good" by the U.S. Geological Survey. Flow at the station is affected by diversion to Mother Brook, diversions to and from the basin for municipal supplies and at times by wastage from the Stony Brook reservoir. The stage-discharge relationship was established at the gage by current meter measurements. The recorded maximum flows are shown below:

Date	Flow (cfs)	WSE near the Gage (ft., MSL)
March 1936	2,540	-
July 1938	2,180	-
August 1955	2,490	-
March 1968	2,670	25.17
December 1973	1,090	23.30
January 1979	3,670	26.50

The recorded maximum flow for February 3, 1976 was 4,150 cfs, larger than any other peak flow shown above.

However, it was caused artifically by the blasting of ice blocks jammed at the crest of the dam.

d. Visual Observations. About 100 ft. upstream of the dam is the Moody Street bridge, a concrete structure with nine arched openings. During the day of the field inspection water was overflowing the dam; out of 28 flashboard bays 13 had two and 15 had three boards in place. The upstream water level at the time of the site visit was estimated to be about El. 34.5.

A manufacturing building on the left downstream bank has been removed. Construction of a fish ladder and a concrete retaining wall in this area were at a stage close to completion. The old outlets to the mill building have been backfilled. Both banks of the river downstream of the dam are protected by riprap.

e. Test Flood Analysis. Based upon the Corps of Engineers guidelines, the recommended test flood for the size (intermediate) and the hazard potential (high) is the Probable Maximum Flood (PMF). The peak flow rate of 65 cfs/sq. mi. has been determined specifically for the Charles River basin as a result of hydrologic studies completed by the Corps of Engineers. The resulting PMF inflow for the 225 sq. mi. drainage area (excluding Stony Brook Basin) is about 14,800 cfs.

Surcharge-storage routing was performed through the reservoir assuming no flashboards at the crest of the dam. The water surface in the reservoir during the test flood was estimated to be at El. 41.7, about 3.8 ft. above the left training wall. The test flood outflow was determined to be 14,560 cfs, which indicates no substantial reduction of flow through the reservoir surcharge-storage. The spillway stage-discharge and the reservoir area-volume curves, which were used in the analysis, are shown in Appendix D. In conclusion, the spillway itself would not be able to pass the test flood without flooding both banks and the shorelands along the reservoir.

f. Dam Failure Analysis. Based on Corps of Engineers Guidelines for Estimating Dam Failure Hydrographs and assuming that 40 percent of the 169 ft. long weir would fail, the peak failure outflow is estimated to be 11,400 cfs. A "reach" between the Moody Street Dam and the

Bleachery Dam was studied for flood routing.

Storage volume of the reach is estimated to be about 110 acre-feet which would reduce the peak failure flood flow to about 10,800 cfs. The related water surface elevations are estimated to be El. 32.2 near the Moody Street Dam, El. 30.8 ft. at a distance of about 1,100 ft. from the dam and El. 27.5 ft. at the Bleachery Dam. This hydraulic profile would result in flooding of an extensive area on both banks of the river. Several buildings with parking lots, manufacturing plants and a playground would be affected. Due to the potential loss of life and extensive property damage that would result from a failure of the dam, the hazard classification is considered high.

SECTION 6 - STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The spillway weir and apron were obscured by flowing water; however, no evidence of settlement, lateral movement or other signs of structural instability was noted. Masonry training walls appeared to be stable.

b. Design and Construction Data. There are no design or construction records to aid in the evaluation of structural stability of the dam. However, the dam has apparently performed satisfactorily for over a hundred years.

c. Operating Records. No operating records are available to aid the evaluation of structural stability.

d. Post-Construction Changes. Other than for the addition of the fishway, and the walkway and flashboard reconstruction shown on the 1959 plans, there are no records of any changes that may have been made to the original dam.

e. Seismic Stability. Moody Street Dam is located in a Seismic Zone 3. Pertinent data needed for a theoretical analysis of seismic stability are unavailable. Therefore, the seismic stability of the dam is unknown.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual examination of Moody Street Dam indicates that the visible portion of the structure are apparently in good condition. However, flowing water prevented a complete examination. There is also no means to lower the water level below the spillway crest. For these reasons, the overall project condition can only be considered fair at this time.

Based on the results of computations included in Appendix D and described in Section 5, the spillway is not capable of passing the test flood, which for this structure is the PMF. The PMF outflow of 14,560 cfs (65 csm) would overtop the dam (left training wall) by about 3.8 ft. With the water level at the top of the left training wall, the spillway (without flashboards) can pass 7,800 cfs which is 54 percent of the test flood.

b. Adequacy of Information. This evaluation of the dam is based primarily on visual examination, approximate hydraulic and hydrologic computations, consideration of past performance and application of engineering judgement. Generally the information available or obtained was adequate for the purposes of a Phase I assessment. However, additional information on the condition of the spillway weir and apron should be obtained as outlined in Section 7.2.

c. Urgency. The recommendations for additional investigations and remedial measures outlined in Section 7.2 and 7.3, respectively, should be undertaken by the Owner and completed within one year after receipt of this report.

d. Need for Additional Investigation. Additional investigations should be performed by the Owner as outlined in Section 7.2.

7.2 Recommendations

It is recommended that the Metropolitan District Commission, owner of the dam, assign or engage a registered professional engineer to undertake the following investigations:

1. Investigate possible measures to provide a means of lowering the water level below the

spillway crest. Consideration should also be given to increasing the capacity of the spillway.

2. Examine the dam at a time when there is low flow to assess the condition of the granite masonry spillway weir, the downstream apron and the flashboards.

3. Assess the potential vulnerability of the dam to seismic events by conventional equivalent static load methods.

7.3 Remedial Measures

Although the visible portions of the dam are generally in good condition, it is considered important that the following items be accomplished.

a. Operation and Maintenance Procedures. The Owner should prepare an operation and maintenance manual for the dam. The manual should include provisions for biennial technical inspection of the dam and for surveillance of the dam during periods of heavy precipitation and high river water levels. The procedures should delineate the routine operational procedures and maintenance work to be done on the dam to ensure satisfactory operation and to minimize deterioration of the facility.

Because the dam is classified as having a "high" hazard potential, the owner should also develop a written emergency preparedness plan and warning system to be used in the event of impending failure of the dam. The plan should be developed in cooperation with local officials and downstream inhabitants.

7.4 Alternatives

Not applicable.

APPENDIX A - INSPECTION CHECK LIST

VISUAL INSPECTION PARTY ORGANIZATION

NATIONAL DAM INSPECTION PROGRAM

Dam: Moody Street

Date: 6 December 1978

Time: 0800 to 1000

Weather: Clear, cool (40° to 50° F)

Water Surface Elevation Upstream: 34.5 (MSL)

Stream Flow: Unknown

Inspection Party:

Peter L. LeCount	- Soils/Geology
Richard A. Brown Haley & Aldrich, Inc.	
A. Ulvi Gulbey	- Hydraulic/Hydrologic
Joseph E. Downing Robert P. Howard Camp, Dresser & McKee, Inc.	- Structural/Mechanical

Present During Inspection:

John Gilmore, MDC
Robert Carr, MDC
Norman Saulnier, MDC

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Moody Street DATE 6 Dec. 78

AREA EVALUATED	CONDITION
DAM EMBANKMENT	Not applicable
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	None observed
Floor of Approach Channel	Not observed - submerged
b. Weir and Training Walls	
General Condition of Concrete	Spillway appears to be of granite masonry. View of the spillway obscured by flowing water General condition of facility is good
Rust or Staining	Minor staining at right upstream wall
Spalling	Minor spalling at right upstream wall
Any Visible Reinforcing	None observed
Any Seepage or Efflorescence	None observed
Drain Holes	None observed
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	Some small trees and minor brush observed
Floor of Channel	Not observed - submerged
Other Obstructions	None observed
d. Other	Fish ladder on left side of dam presently under construction in excellent condition

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Moody Street DATE: 6 Dec. 78

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. Superstructure	
Bearings	Not observed
Anchor Bolts	Not observed
Bridge Seat	Good
Longitudinal Members	Good
Under Side of Deck	Not applicable
Secondary Bracing	Good
Deck	Grating in good condition
Drainage System	Not applicable
Railings	Good
Expansion Joints	None observed
Paint	Good
b. Abutment and Piers	
General Condition of Concrete	Good
Alignment of Abutment	Good
Approach to Bridge	Good
Condition of Seat and Backwall	Good
OUTLET WORKS - GATEHOUSE	Not applicable

APPENDIX B - ENGINEERING DATA

Document	Contents	Location
"Charles River Flood Control Project, Moody Street Dam", MDC Contract No. 253, 2 November 1959	Plan, typical section and details (4 sheets)	MDC, 20 Somerset Street, Boston, MA
"Charles River Reservation, Proposed Repairs to Moody Street Dam, Waltham", MDC Contract No. 2145, September 1971	Plans and sections showing proposed work that was never completed (3 sheets)	MDC, 20 Somerset Street, Boston, MA
"Representative Richard E. Landry Riverbank Park Development", MDC Contract No. E77-27 P&R, 15 December 1977	Plans and details for construction of fishway at left abutment and sitework on left side (8 sheets)	MDC, 20 Somerset Street, Boston, MA
Construction Photographs	Set of 46 photographs taken during 1978 construction of "Landry Park Project"	MDC, 20 Somerset Street, Boston, MA

OK FILE Lieli

INSPECTION REPORT - DAMS AND RESERVOIRS

(1.) Location: City/~~Town~~ WALTHAM DAM NO. 4-9-308-1

Name of Dam MOODY STREET DAM Inspected by A. Z. PIZAN + F.H. PARE

Date of Inspection 3-22-'74

(2.) Owners: ~~per~~ Ass. ✓ Prev. Inspection

Reg. of Deeds Pers. Contact

1. METZ, DIST. COMM., 20 SOMERSET ST, BOSTON MASS. 02114 727-5215
Name St. & No. City/~~Town~~ State Tel.No.

2. Name St. & No. City/Town State Tel.No.

3. Name St. & No. City/Town State Tel.No.

(3.) Caretaker: (If any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

SAME Name St. & No. City/Town State Tel.No.

(4.) No. of Pictures taken NONE

(5.) Degree of Hazard: (If dam should fail completely)*

1. Minor 2. Moderate

3. Severe ✓ 4. Disastrous

*This rating may change as land use changes (future development)

(6.) Outlet Control: Automatic Manual

Operative Year: no.

Comments: WATER FLOWS, UNCONTROLLED OVER SPILLWAY.

(7.) Upstream Rec. Structure: Condition:

1. Good ✓ 2. Minor Repairs

3. Major Repairs 4. Urgent Repairs

Comments:

DAM NO. 4-9-308-1

(8) Downstream Face of Dam: Condition: 1. Good ✓ 2 Minor Repairs____

3. Major Repairs___ Urgent Repr___

Comments:_____

(9) Emergency Spillway: Condition: 1. Good____ 2. Minor Repairs____

3. Major Repairs___ 4. Urgent Rep___

Comments: THERE IS NO EMERGENCY SPILLWAY.

(10) Water level @ time of inspection / ft. above ✓ below____

top of dam____ Principal spillway ✓

other_____

(11) Summary of Deficiencies Noted:

Growth (Trees and Brush) on Embankment_____

Animal Burrows and Washouts_____

Damage to slopes or top of dam_____

Cracked or Damaged Masonry_____

Evidence of Seepage_____

Evidence of Piping_____

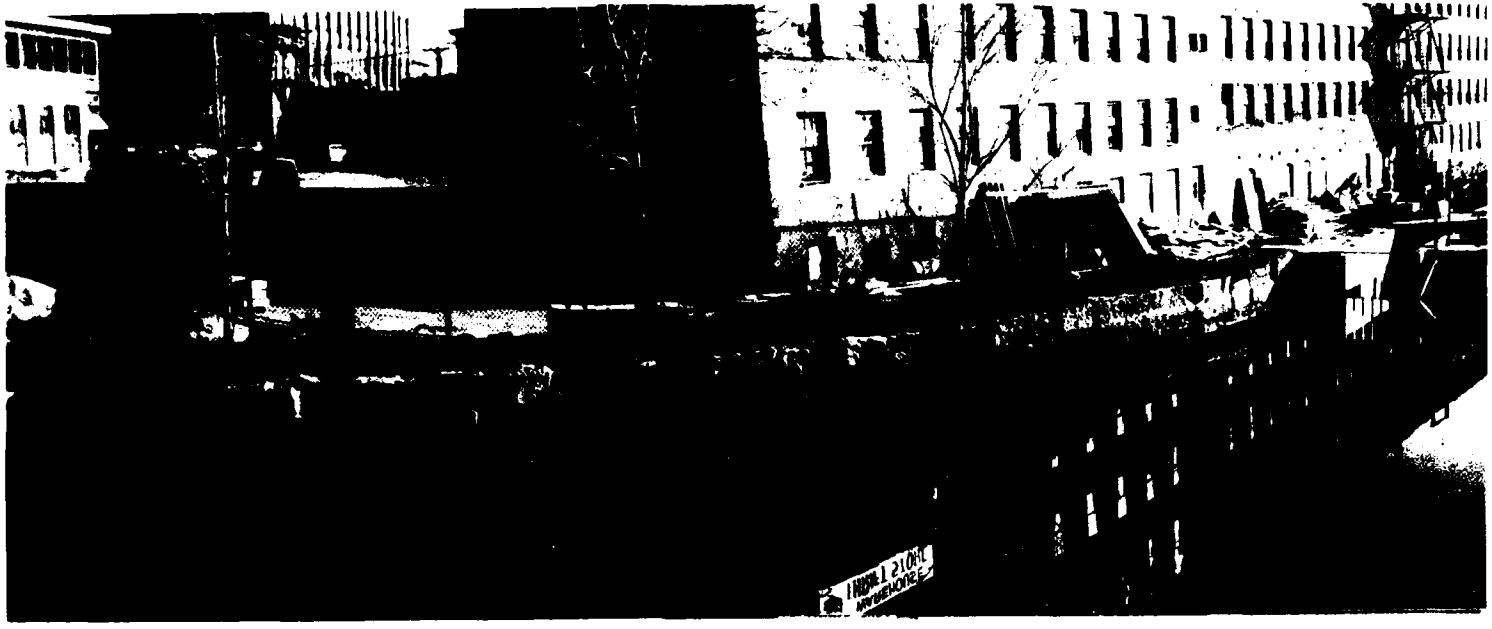
Erosion_____

Leaks_____

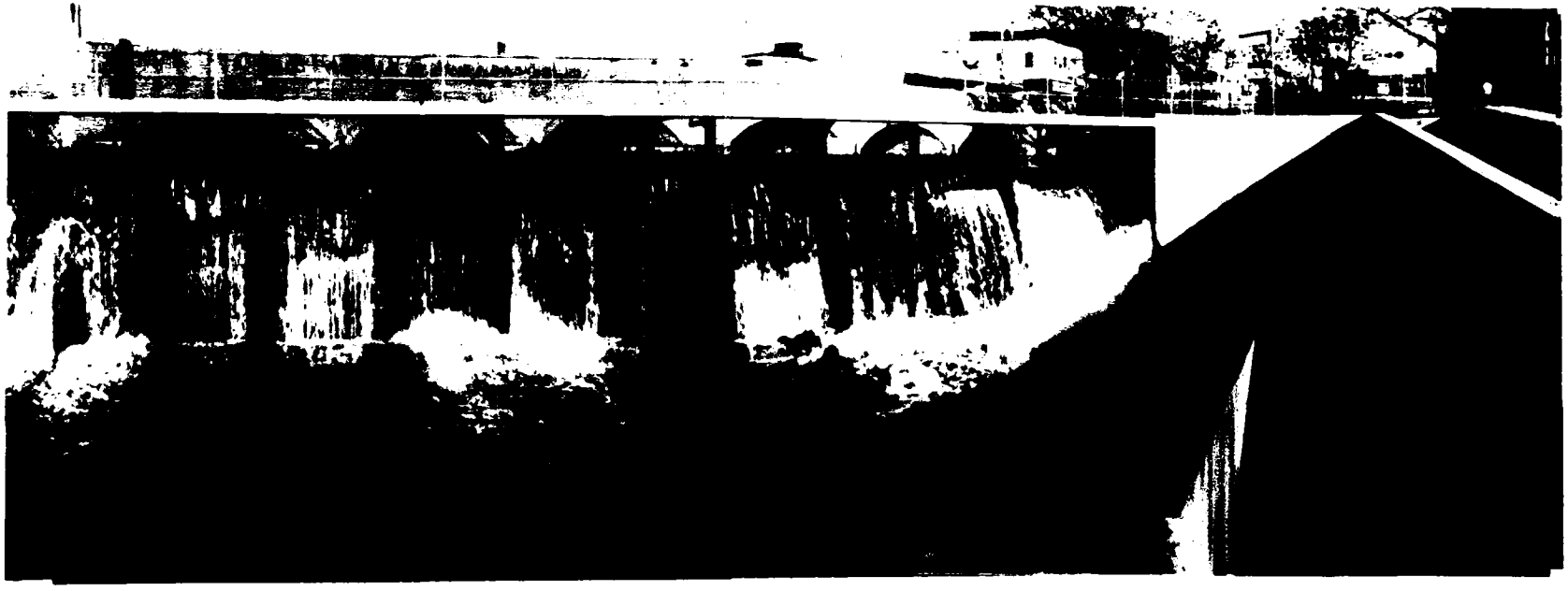
Trash and/or debris impending flow_____

Clogged or blocked spillway_____

Other NO DEFICIENCIES NOTED



8. Left training wall, upstream

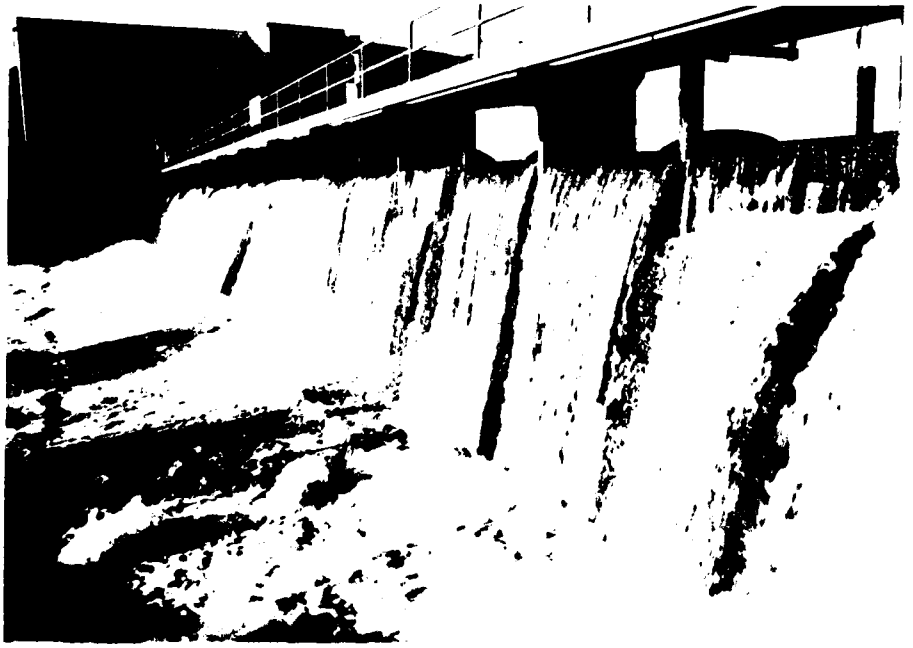


7. Left training wall, downstream

5. Right training wall, downstream, and detail of flashboard stanchions

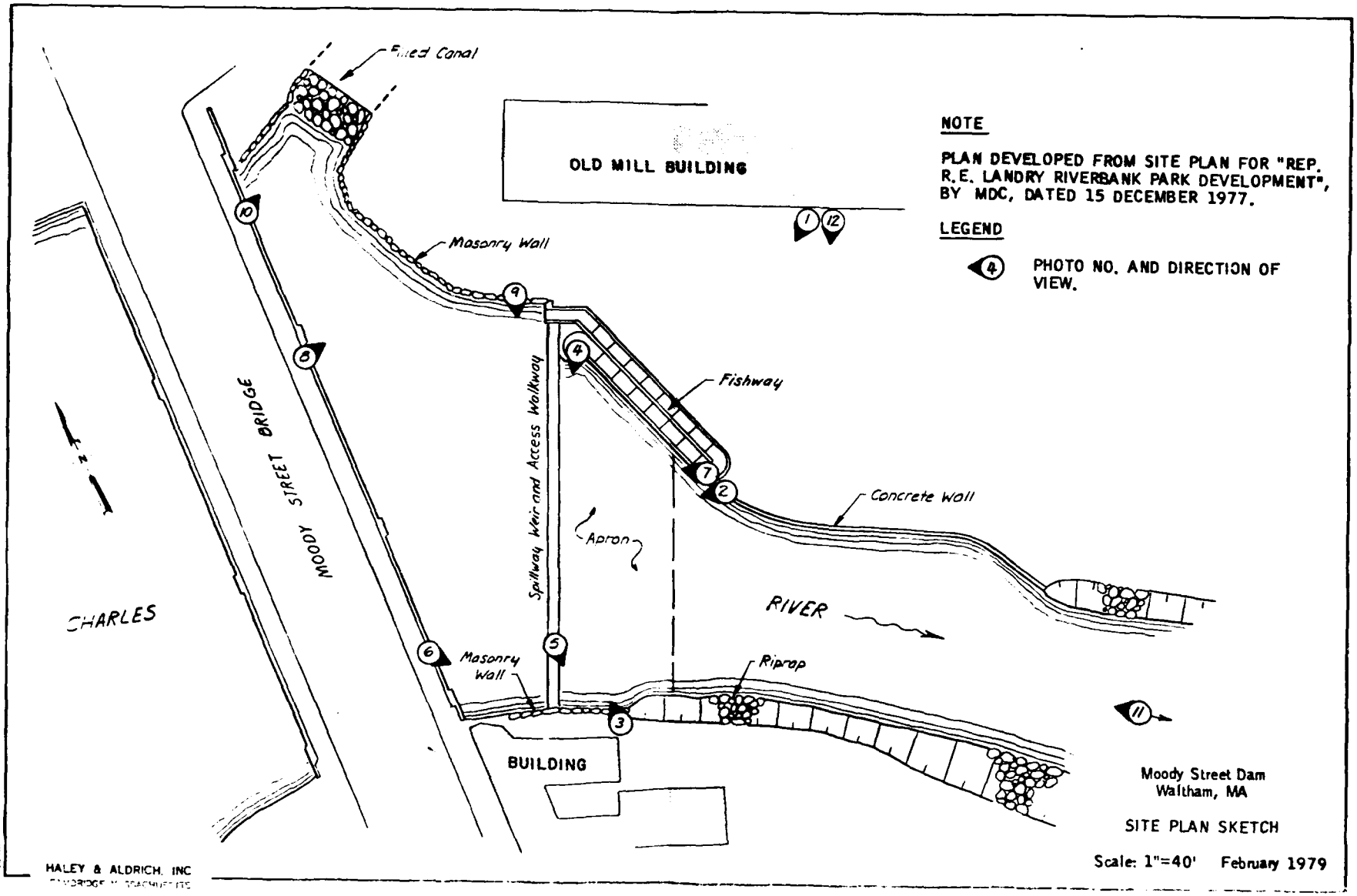
6. Right training wall, upstream

3. Spillway viewed from right bank



4. Spillway viewed from left bank

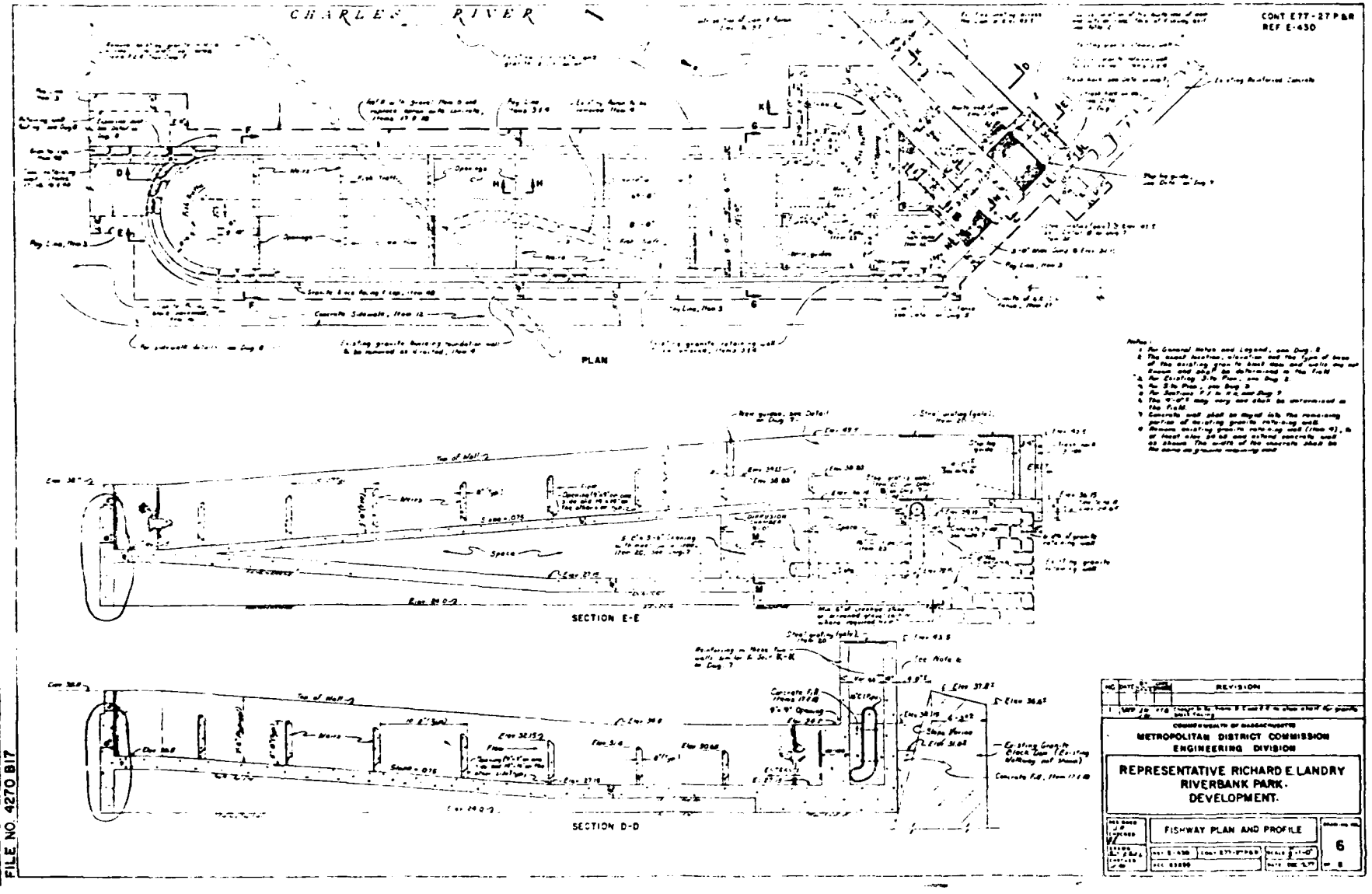
2. Spillway viewed from downstream end of fishway

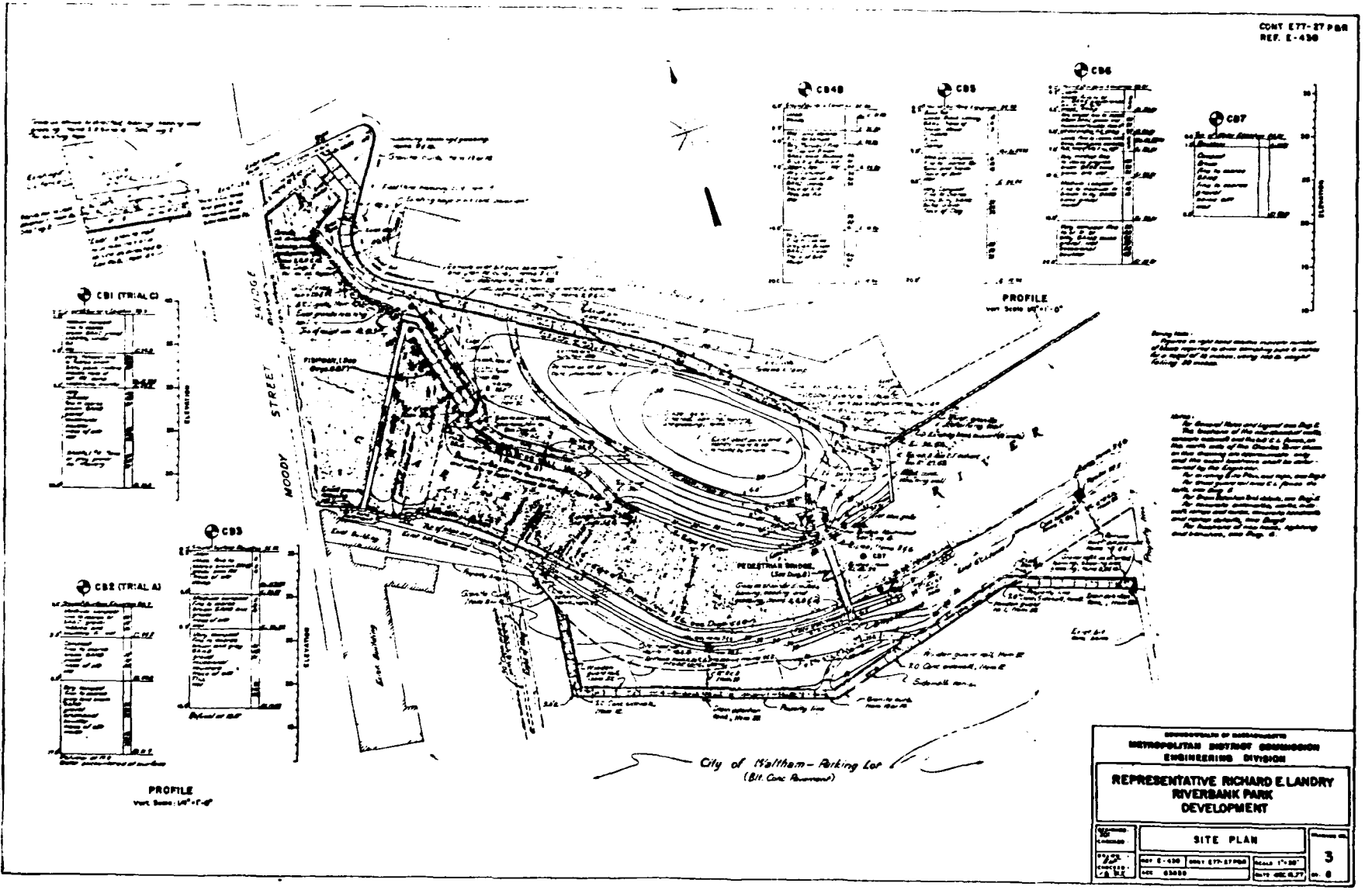

Filled Canal
OLD MILL BUILDING
Masonry Wall
Fishway
Spillway Weir and Access Walkway
MOODY STREET BRIDGE
CHARLES
RIVER
Apron
Concrete Wall
Masonry Wall
Riprap
BUILDING
NOTE
PLAN DEVELOPED FROM SITE PLAN FOR "REP. R.E. LANDRY RIVERBANK PARK DEVELOPMENT", BY MDC, DATED 15 DECEMBER 1977.
LEGEND
PHOTO NO. AND DIRECTION OF VIEW.
Moody Street Dam
Waltham, MA
SITE PLAN SKETCH
Scale: 1"=40' February 1979
HALEY & ALDRICH, INC
FILE NO. 42/0 820

APPENDIX C - PHOTOGRAPHS

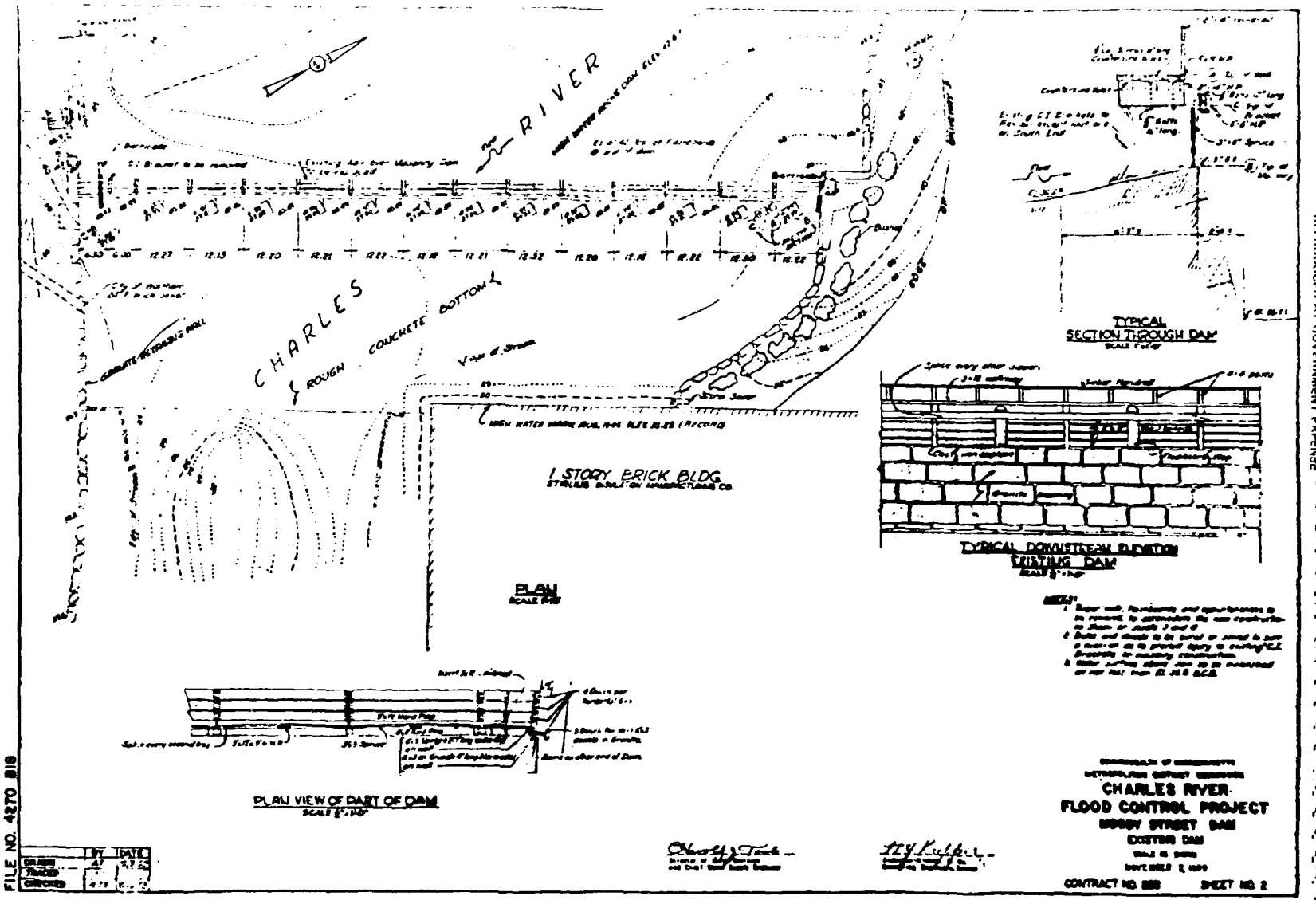
No.	Title	Roll	Frame	Page
1.	Overview of Moody Street Dam	C28	4A	vi
2.	Spillway viewed from downstream end of fishway	C28	8A,9A	C-2
3.	Spillway viewed from right bank	C28	16A	C-3
4.	Spillway viewed from left bank	C28	10A	C-3
5.	Right training wall, downstream, and detail of flashboard stanchions	C28	28A	C-4
6.	Right training wall, upstream	6	5	C-4
7.	Left training wall, downstream	6	00,0	C-5
8.	Left training wall, upstream	6	2,3	C-6
9.	Upstream side of dam, viewed from left bank	C28	26A	C-7
10.	Filled canal, upstream from dam, on left side	C28	22A	C-7
11.	Downstream channel	7	23	C-8
12.	Downstream channel	C28	5A	C-8

FILE NO. 4270 B17



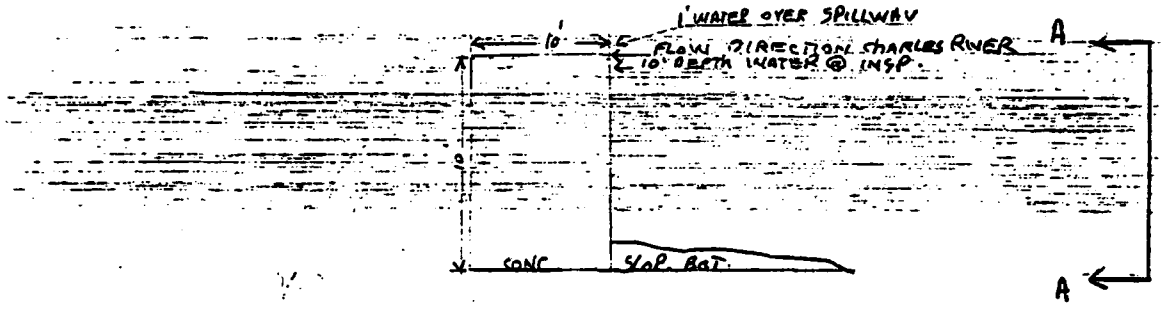


FILE NO. 4270 B16


RIVER
CHARLES
ROUGH CONCRETE BOTTOM
1 STORY BRICK BLDG.
PLAN
PLAN VIEW OF PART OF DAM
TYPICAL SECTION THROUGH DAM
TYPICAL DOWNSTREAM ELEVATION EXISTING DAM
CHARLES RIVER
FLOOD CONTROL PROJECT
MOODY STREET DAM
EXISTING DAM
CONTRACT NO. 888
SHEET NO. 2
FILE NO. 4270 B16

3.

4-9-308-1



X SECTION A A

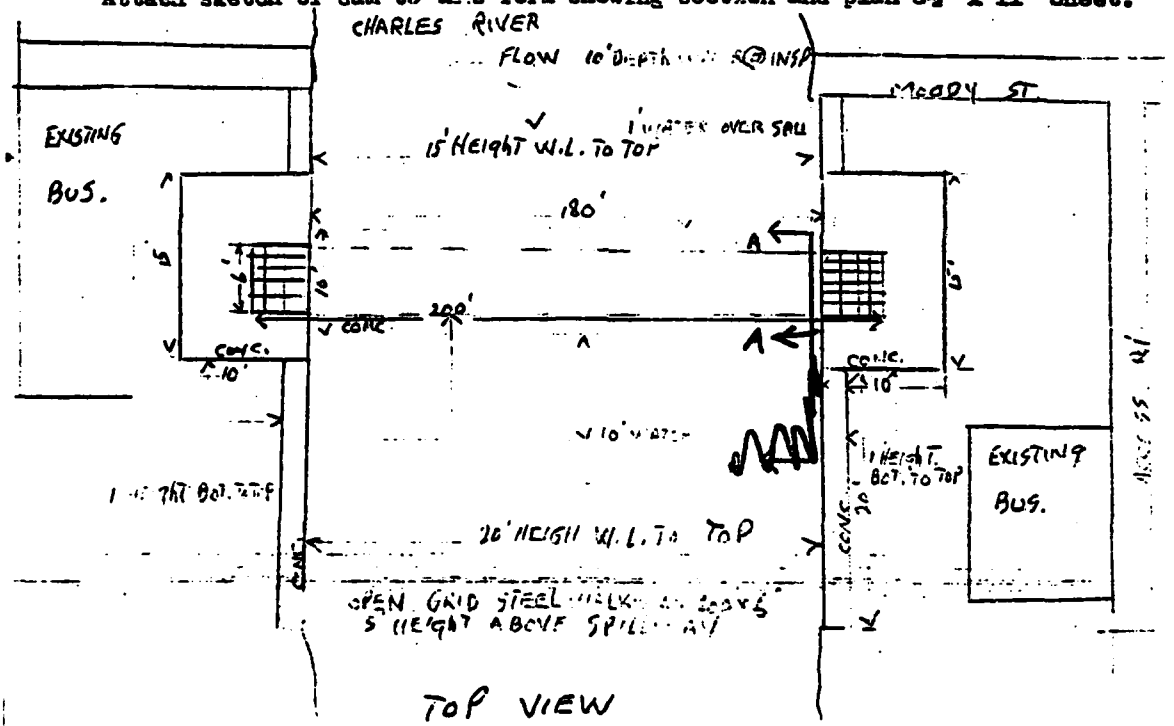
NOT TO SCALE

DAM NO. 4-9-308-1

10.
Risk to life and property in event of complete failure.

No. of people EST. 200
No. of homes NONE
No. of businesses EST. 12
No. of industries NONE Type
No. of utilities 4 Type
Railroads 4
Other dams CHARLES RIVER DAM, NONANTUM, 4-9-207-3, 1 MILE DOWNSTREAM
Other NEWTON BLEACHERY DAM.

11.
Attach sketch of dam to this form showing section and plan 8½" x 11" Sheet.



DESCRIPTION OF DAM
DISTRICT #4

Submitted by FRANCIS H PARÉ & ADAM Z. PIZAN Dam No. 4-9-308-1
Date 3-12-74 City/Town WALTHAM 02154
Name of Dam MOODY STREET DAM

1. Location: Topo Sheet No. 31C
Provide 3½" x 11" in clear copy of topo map with location of Dam clearly indicated.

2. Year built UNKNOWN Year/s of subsequent repairs UNKNOWN

3. Purpose of Dam: Water Supply ____. Recreational ____.
Irrigation ____. Other FLOW CONTROL

4. Drainage Area: EST. 4 SQ. MI. 2560 ACRES.

5. Normal Ponding Area: 9 acres; Ave. Depth 10'
Impoundment: 30 MIL gals; 90 acre ft.

6. No. and type of dwellings located adjacent to pond or reservoir (i.e. summer homes etc.) NUMEROUS BUSINESS ADJACENT TO CHARLES RIVER

7. Dimensions of Dam: Length 180 Max. Height 10'
Slopes: Upstream Face VERT.
Downstream Face "
Width across top 10'

8. Classifications of Dam by Materials:
Earth ____. Conc. Masonry ✓, Stone Masonary ____
Timber ____. Rockfill ____. Other ____

9. A Description of present land usage downstream of dam: 25 % rural;
75 % urban
B Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure?
no ✓ yes ____.

DAM NO. 4-9-308-1

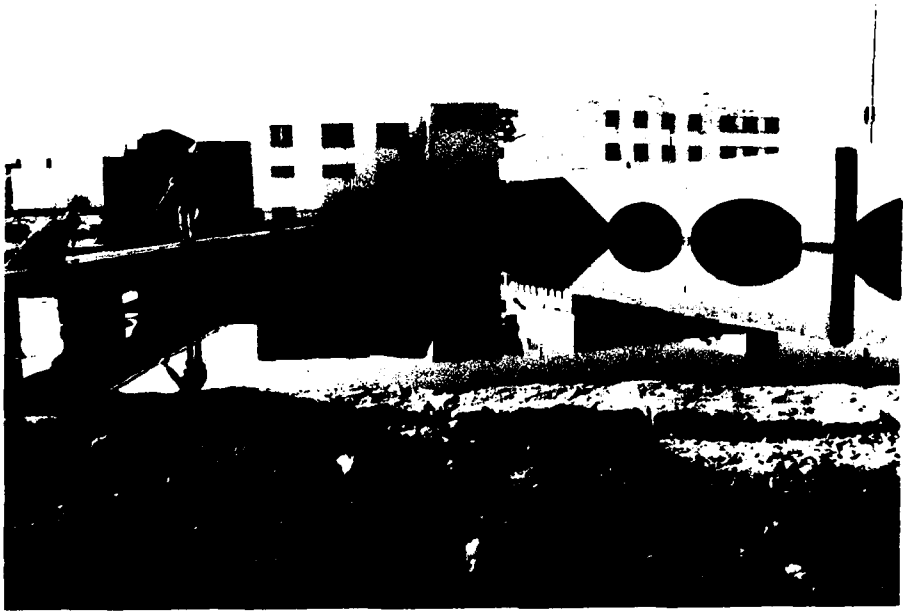
(12) Remarks & Recommendations: (Fully Explain)

DAM IS IN GOOD CONDITION.

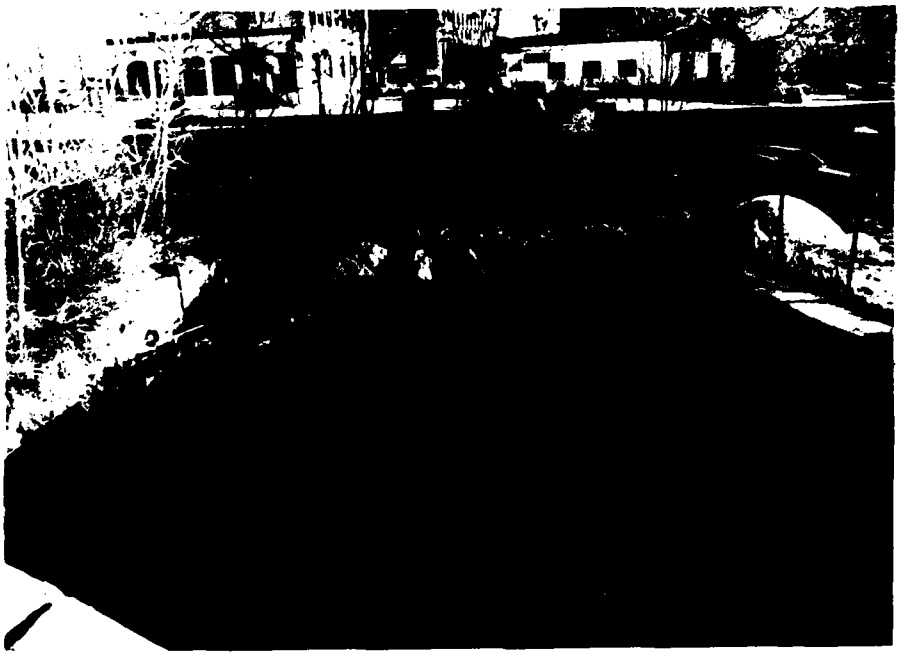
(13) Overall Condition:

1. Safe ✓
2. Minor repairs needed _____
3. Conditionally safe - major repairs needed _____
4. Unsafe _____
5. Reservoir impoundment no longer exists (explain)

Recommend removal from inspection list _____



9. Upstream side of dam, viewed from left bank

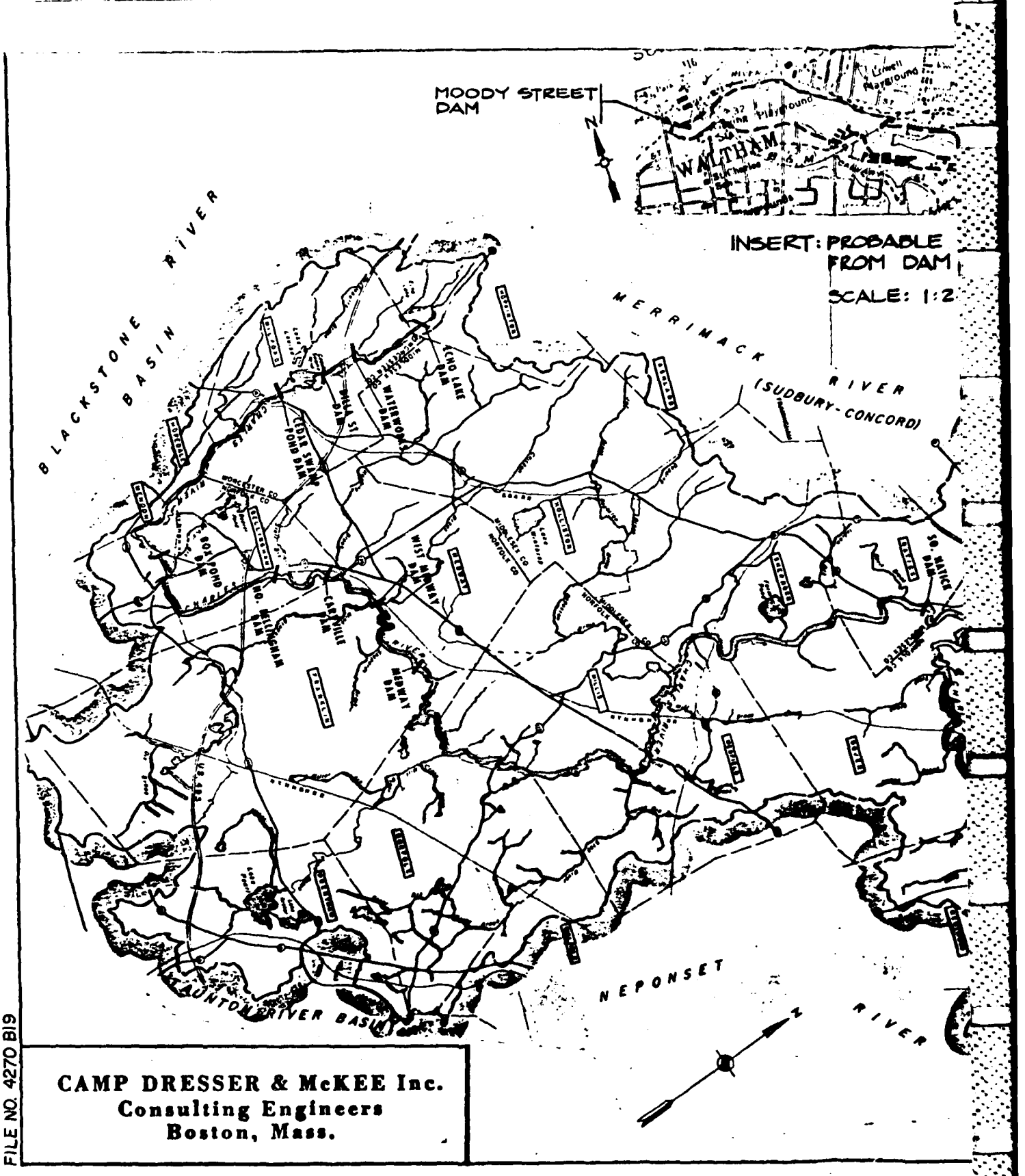


10. Filled canal, upstream from dam, on left side

11. Downstream channel

12. Downstream channel

APPENDIX D - HYDROLOGIC AND HYDRAULIC COMPUTATIONS



FILE NO. 4270 B19

CAMP DRESSER & McKEE Inc.
Consulting Engineers
Boston, Mass.

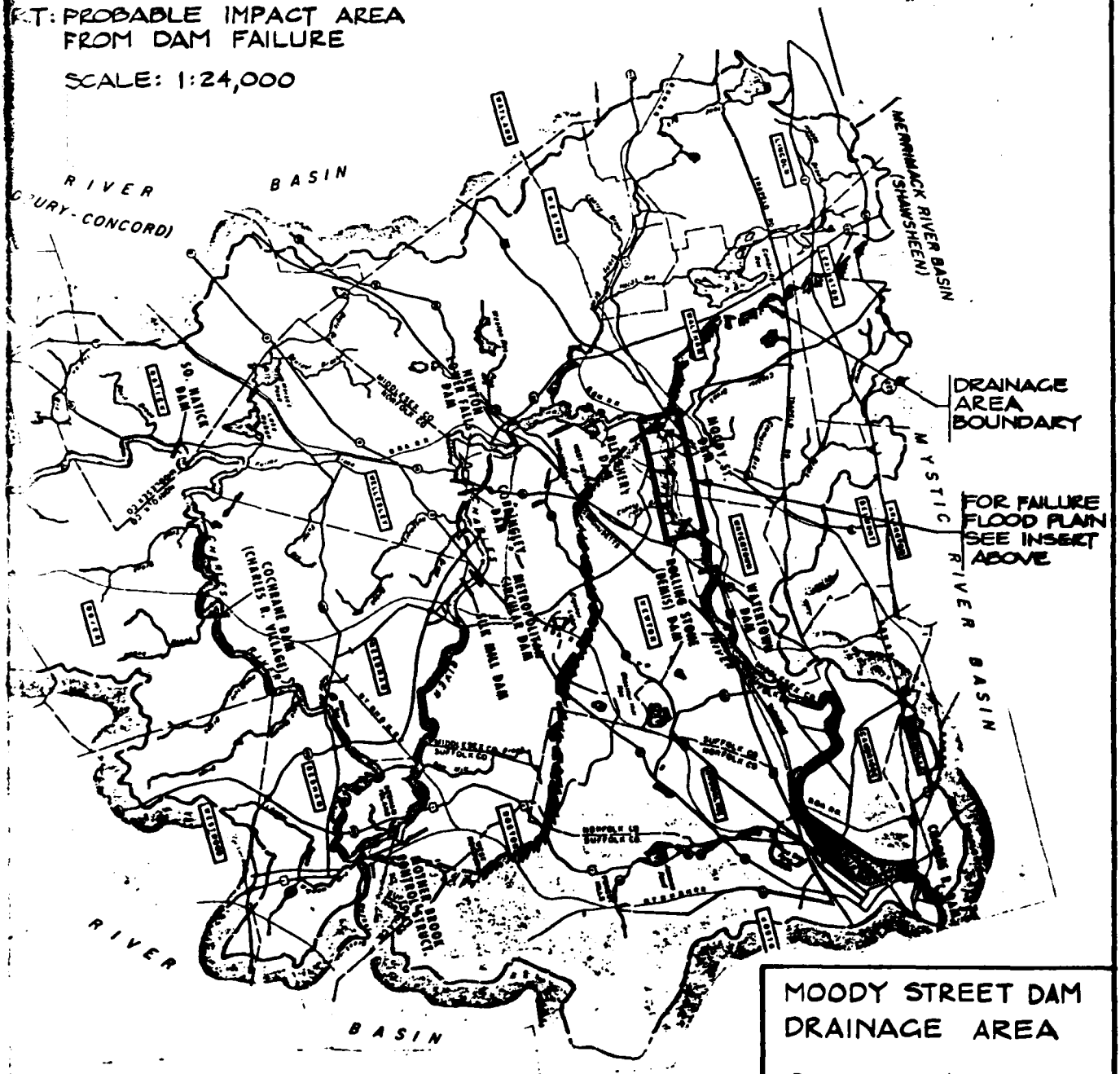
D-1

1 of 2

FLOOD IMPACT AREA BOUNDARY

RT: PROBABLE IMPACT AREA FROM DAM FAILURE

SCALE: 1:24,000



MOODY STREET DAM
DRAINAGE AREA

SCALE: 1:150,000

D-1

2 of 2

CAMP DRESSER & MCKEE INC. CLIENT H & A JOB NO 561-9-Rt-7 PAGE 1
PROJECT COE Dam Inspection DATE CHECKED 3/5/79 DATE 1/18/79
DETAIL Moody St. Dam CHECKED BY AUG COMPUTED BY K.S. Chin

Size Classification

Hydraulic Height :

El. @ top of the Dam : 37.9

The lowest point in the river bed downstream of the apron 16.4

Height : 21.5 - ft.

Storage : 2,950 acre-ft for elev. 37.9 .

1000 acre-ft < 2,950 < 50,000

Size Classification : INTERMEDIATE

Hazard Potential

In the event of a dam failure 2-3 feet high flood waves would hit a manufacturing plant, parking lots and basement floors of the apartment blocks and a children's playground. All these would create a potential for loss of life to several people as well as extensive damage to the properties. Therefore the hazard classification is considered high.

Hazard Potential : HIGH .

Test Flood

For size classification of "intermediate" and hazard potential of "high" the "Test Flood" is PMF.

PMF = 65 cfs/sqmi × 227 sqmi = 14,800 cfs.

Notes: (1) 65 cfs/sqmi was established in COE guidelines for the Charles River Basin.

(2) The drainage area excludes the Stony Brook basin, which is diverted into the Cambridge Water Supply reservoir.

Surcharge - Storage Routing

Assume no flashboards on top of the dam - Spillway:

Q_{p_1} = 14,800 cfs → WSE : 41.7 (MSL); See Stage - Discharge Curve, Page D-4

Surcharge Volume: 4,600 − 1,450 = 3,150 ac-ft (See Area - Vol. Curve, Page D-5)

STOR 1 : $\frac{3,150 \times 12}{227.640}$ = 0.26 -in → $Q_{p_2} = 14,800\left(1 - \frac{0.26}{19}\right) = 14,600$ cfs.

Effect of the surcharge - storage on the test flood inflow is almost negligible.

Water depth on top of the Spillway: 9.4 -ft, max.
(This includes the effect of the backflow from the downstream channel).

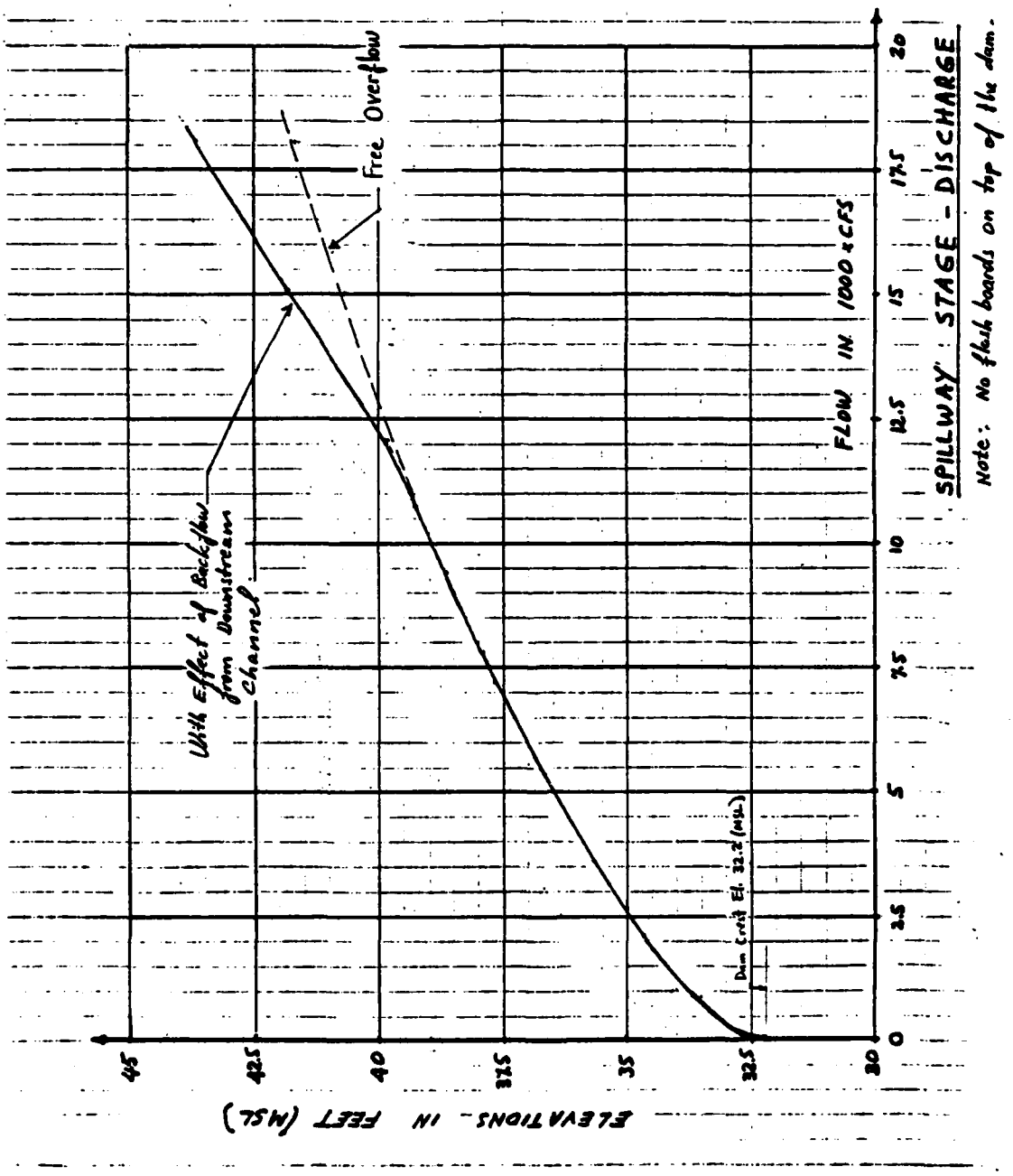
Conclusion: The spillway would pass the test flood with a considerable surcharge.

CAMP DRESSER & MAHAR INC.

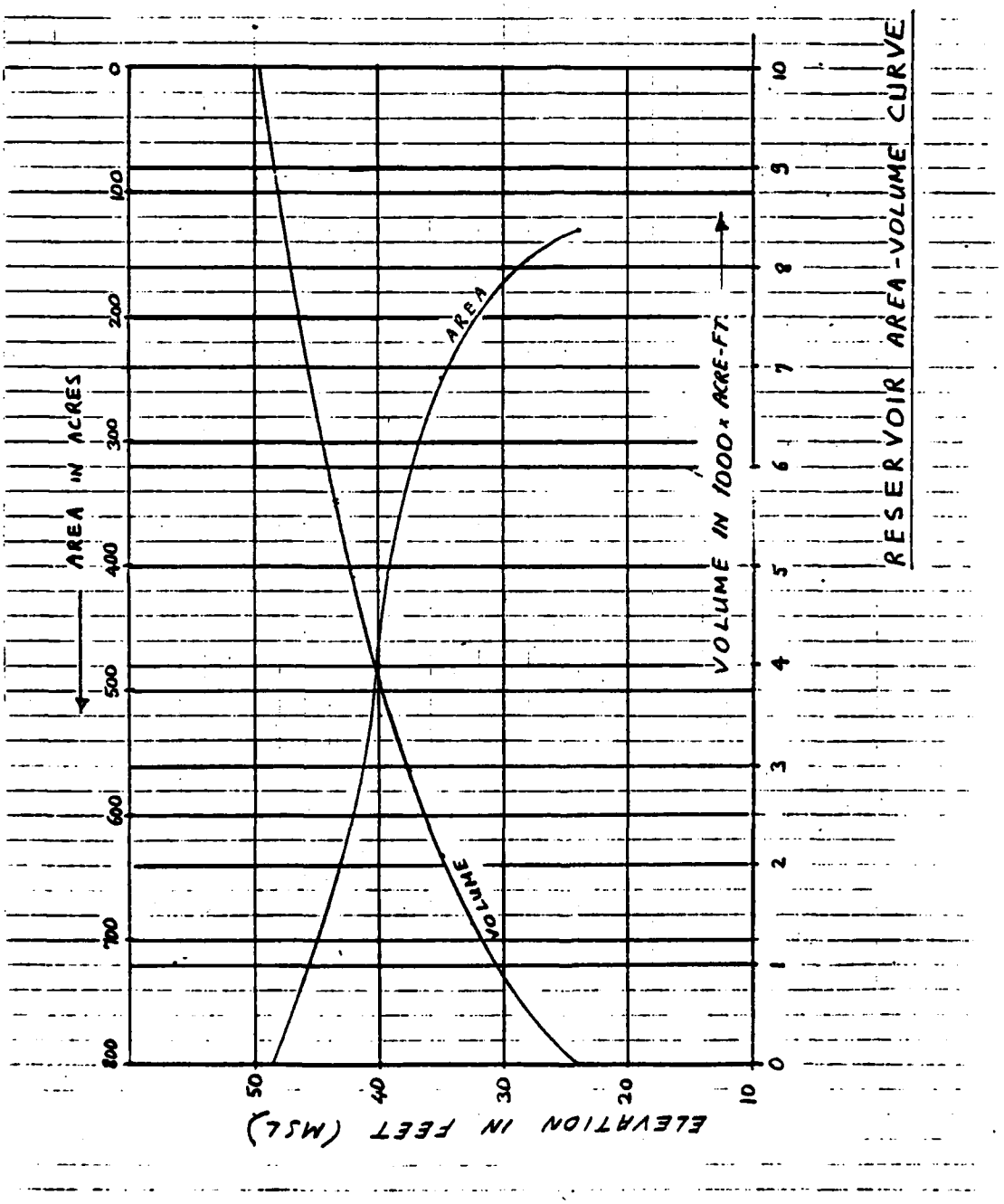
CLIENT H&A JOB NO 561-9-Rt-7 PAGE 3

PROJECT COE Dam Inspection DATE CHECKED 2/5/79 DATE 1/18/79

DETAIL Moody St. Dam CHECKED BY AUG COMPUTED BY K.S. Chin

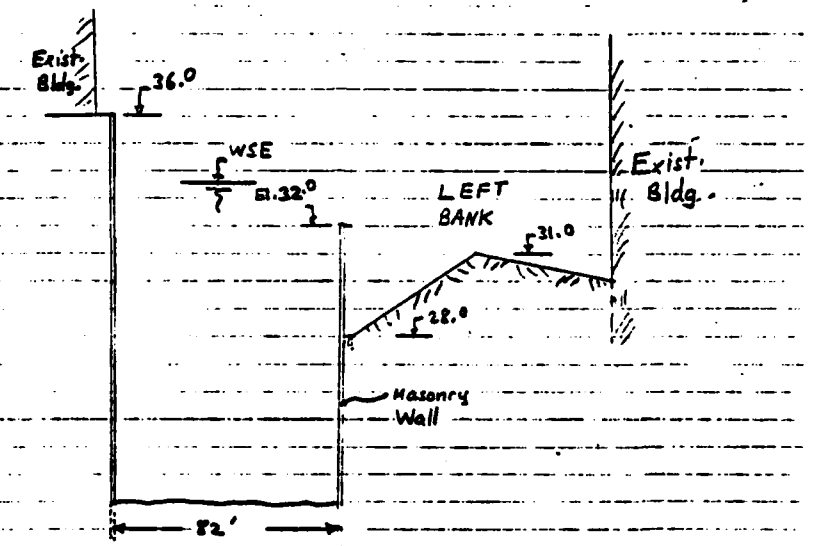


CAMP DRESSER & MCKEE INC. CLIENT H&A JOB NO 561-9-R&-7 PAGE 4
PROJECT COE Dam Inspection DATE CHECKED 2/5/79 DATE 1/12/79
DETAIL Mandy St. Dam CHECKED BY AUG COMPUTED BY K.S. Chin



CAMP DRESSER & MCKEE INC. CLIENT H&A JOB NO 561-9-RT-7 PAGE 5
PROJECT COE Dam Inspection DATE CHECKED 2/5/79 DATE 1/19/79
DETAIL Moody St. Dam. CHECKED BY AHG COMPUTED BY K.S. Chin

Tail Water



DOWNSTREAM CHANNEL SECTION
(Looking Upstream)

The section shown above is about 150-ft downstream from the dam.

$n = 0.030$ $S = \frac{27-20}{1850} = 0.0038$ (From COE's 1968 profile)

$Q = \frac{1.49}{n} R^{2/3} S^{1/2} A$ A stage-discharge curve including flood flows over the left bank is shown in Page D-7.

For $Q = 14,560$ cfs → $d = 11.6$-ft or WSE = 33.6 Ft (MSL)

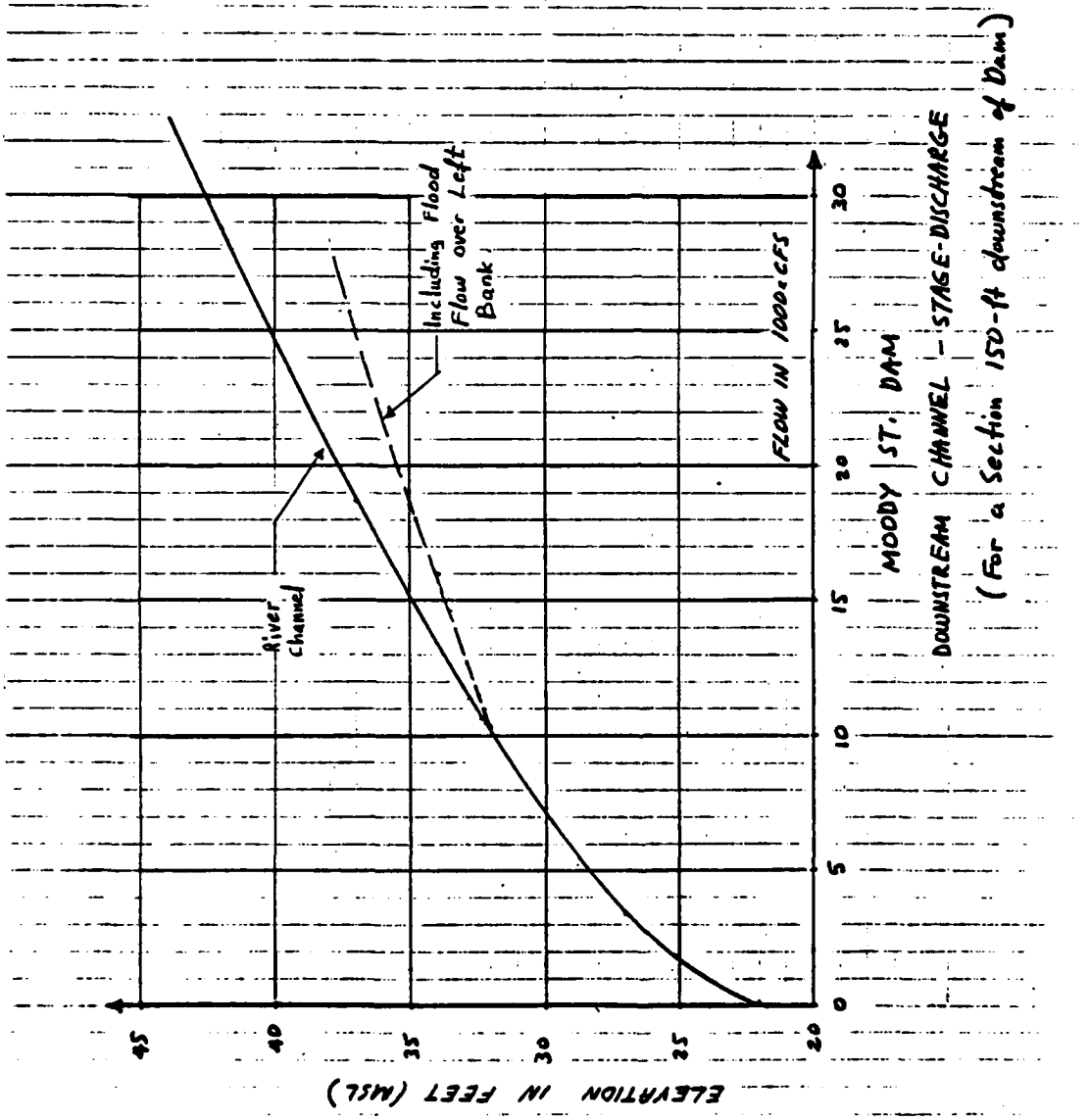
The water surface elevation in the river is about 1.4-ft above the dam crest; the overflow at this stage would be submerged. The pool elev. under this condition would be as shown by the solid lined curve on Page D-4.

CAMP DRESSER & McKEE INC.

CLIENT H&A
PROJECT COE Dam Inspection
DETAIL Moody St. Dam

JOB NO 561-9-RT-7
DATE CHECKED 2/5/79
CHECKED BY AHG

PAGE 6
DATE 1/19/79
COMPUTED BY K.S. Chin



CAMP DRESSER & MCKEE INC. CLIENT H&A JOB NO 561-9-Pf-7 PAGE 7
PROJECT COE Dam Inspection DATE CHECKED 2/6/79 DATE 11/22/79
DETAIL Moody St. Dam CHECKED BY AHG COMPUTED BY K.S. Chin

Dam Failure Analysis

$Q_{p_1} = \frac{8}{27} W_b \sqrt{g} Y_o^{3/2}$ $\quad W_b = 0.4 L_m \quad L_m \cong 170\text{-ft}.$

$W_b = 68\text{-ft}.$

$Y_o = 37.90 - 16.35 = 21.55\text{-ft}$ (El. 16.35 is at the lowest point, downstr. of the apron)

$Q_{p_1} = \frac{8}{27} 68 \cdot 5.67 \cdot 21.55 = 11,400$ cfs.

Downstream Channel

$Q_{p_1} = 11,400$ cfs. WSE @ Pond: 37.9 $\rightarrow$ S = 2,950 ac-ft.

Reach: between the Moody St. Dam and the Bleachery Dam: $L \cong 4,400\text{-ft}.$

WSE's in the channel: (a) 150-ft downst. of the dam: 32.6 (Page D-7)
(b) At the gaging stn.: 30.8 (Page D-9)

$V_1 = \frac{940 + 1320}{2} 4400 = 114$ ac-ft.

$Q_{p_2} = 11,400 \left(1 - \frac{114}{2100}\right) = 10,860$ cfs $\rightarrow V_2 = 108$ ac-ft.

$V_{AV} = \frac{114 + 108}{2} = 111 \rightarrow Q_{p_3} = 10,800$ cfs.

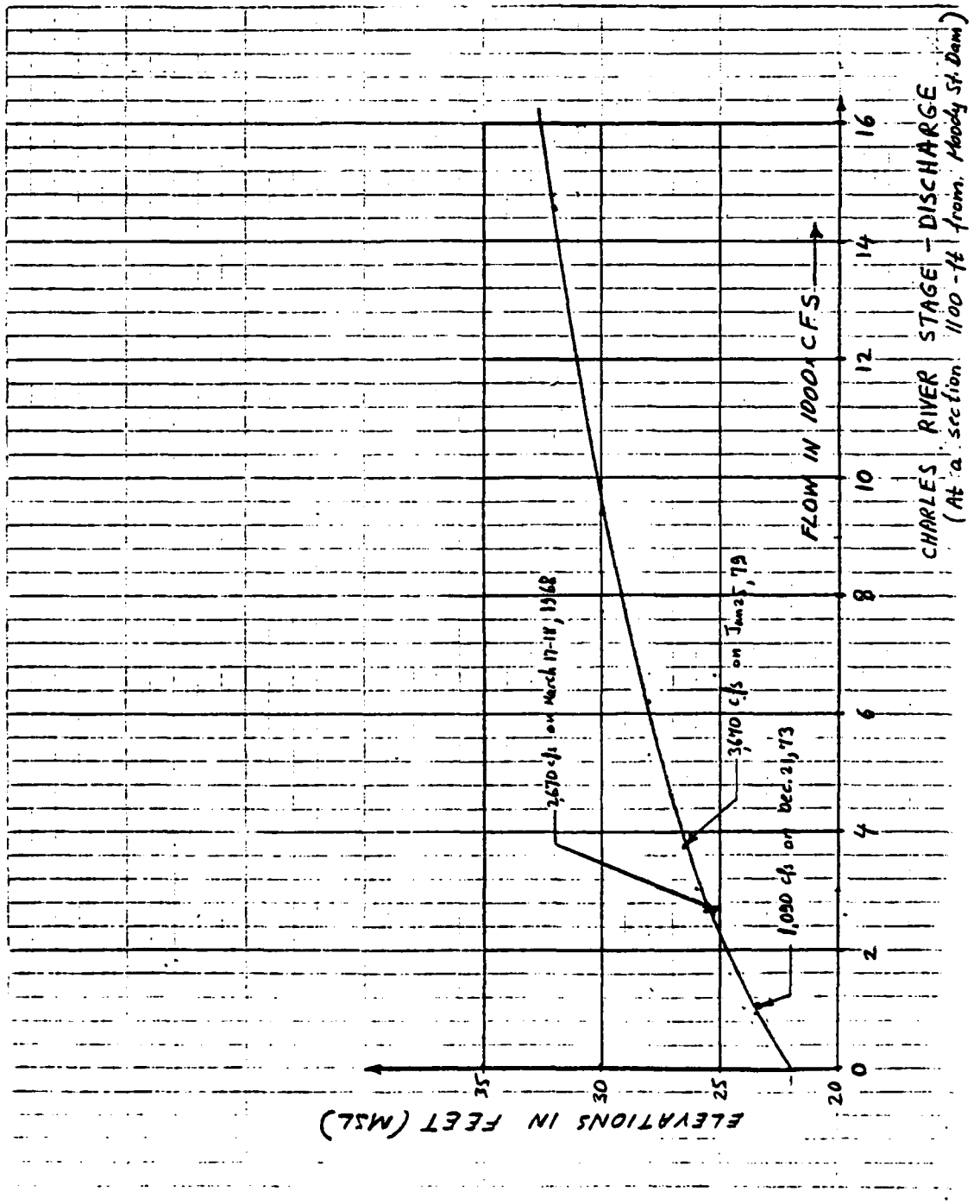
WSE @ the Bleachery dam is estimated to be 27.5 ft for Q = 10,800 cfs. This would cause flooding of about 100-ft wide strip of land on the left bank and about 300-ft wide strip on the right bank.

CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT H & A
PROJECT COE Dam Inspection
DETAIL Moody St Dam

JOB NO. 561-9-RT-7
DATE CHECKED 2/7/79
CHECKED BY AHG

PAGE 8
DATE 1/22/79
COMPUTED BY K. S. Chin



CAMP DRESSER & McKEE INC.

CLIENT MKC JOB NO 261-4-KC-7 PAGE 3

PROJECT COE Dam Inspection DATE CHECKED 2/7/79 DATE 1/22/79

DETAIL Moody St. Dam CHECKED BY AUG COMPUTED BY K.S. Chin

A review of the preliminary hydraulic profile of the failure indicates that flooding would start at the left bank of the dam and spread on the both banks at about 700 -ft downstream of the dam. Several buildings with parking lots on the river side, manufacturing plants and a children playground would be hit with two to three feet high flood waves, which would cause a % potential loss of life for several people and extensive property damage.

APPENDIX E - INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST	(7) STATE	(8) COUNTY	(9) CONGR DIST	(9) NAME	(12) LATITUDE (NORTH)	(13) LONGITUDE (WEST)	(14) REPORT DATE DAY | MO | YR
MA	595	01	25	017	04				CHOATE STREET DAM	4222.9	7114.2	21FEB79

(15) POPULAR NAME	(16) NAME OF IMPOUNDMENT
	CHARLES RIVER

(17) REGION	(18) BASIN	(19) RIVER OR STREAM	(20) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(21) DIST FROM DAM (MI.)	(22) POPULATION
01	19	CHARLES RIVER	NATICK	0	56757

(23) TYPE OF DAM	(24) YEAR COMPLETED	(25) PURPOSES	(26) STRUCTURAL HEIGHT (FT.)	(27) HYDRAULIC HEIGHT (FT.)	(28) IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	NORMAL (ACRE-FT.)
EARTH	1967	C	22	22	2950	2100

(29) DIST	(30) OWN	(31) FED	(32) REGULATED	(33) INSPECTED	(34) VERIFIED	(35) DATE
	N	N	N	N		07MAR79

(36) REMARKS

(37) D/S HAS	(38) SPILLWAY CREST LENGTH	(39) TYPE	(40) WIDTH (FT.)	(41) MAXIMUM DISCHARGE (CFS)	(42) VOLUME OF DAM (CY)	(43) POWER CAPACITY INSTALLED (MW)	(44) PROPOSED (MW)	(45) NAVIGATION LOCKS NO	(46) LENGTH (FT.)	(47) WIDTH (FT.)	(48) LENGTH (FT.)	(49) WIDTH (FT.)	(50) LENGTH (FT.)	(51) WIDTH (FT.)	(52) LENGTH (FT.)	(53) WIDTH (FT.)
Y	169	C	169	7800	456											

(54) OWNER	(55) ENGINEERING BY	(56) CONSTRUCTION BY
METROPOLITAN DIST. COMM.		

(57) REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
COE	COE	MDC	MDC, MA DPW

(58) INSPECTION BY	(59) INSPECTION DATE DAY | MO | YR	(60) AUTHORITY FOR INSPECTION
HALEY & ALDRICH, INC.	06DEC78	PUBLIC LAW 92-367

(61) REMARKS

END

FILMED

7-85

DTIC